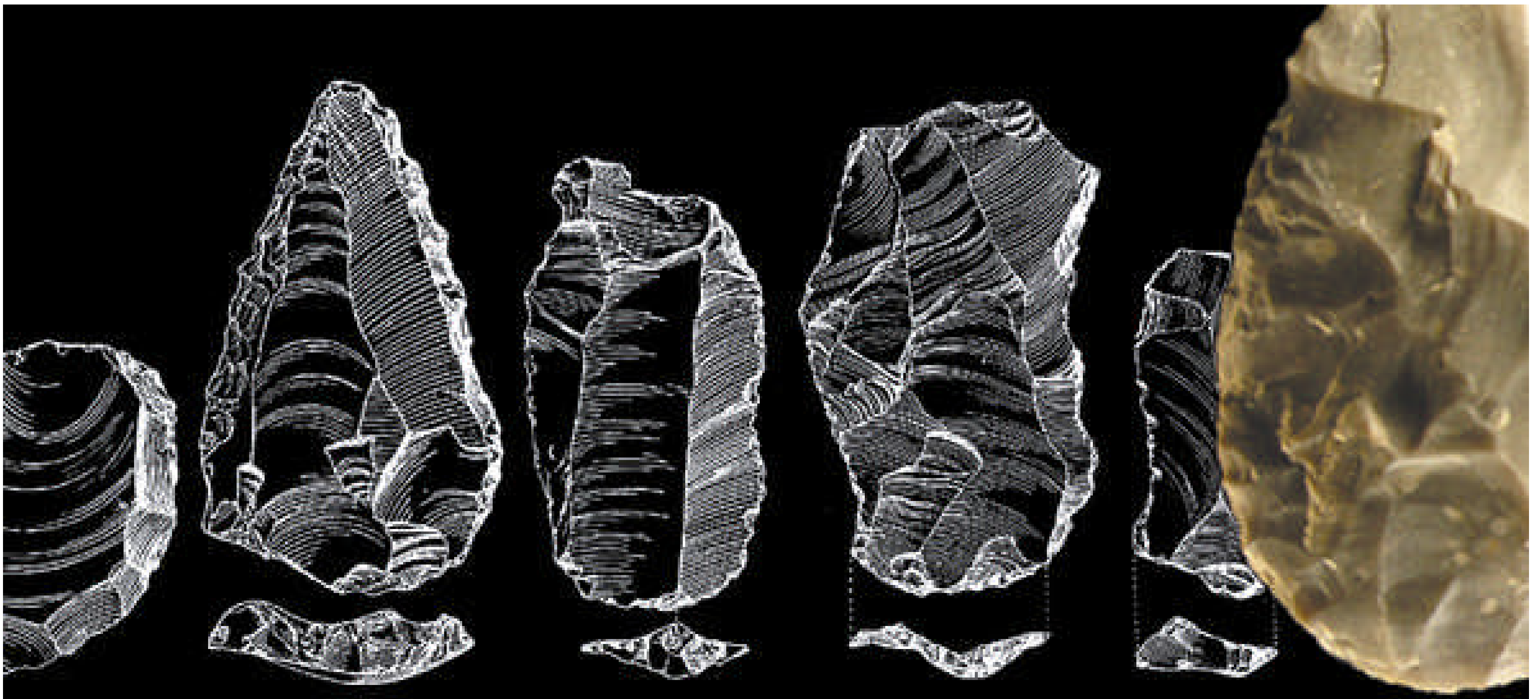
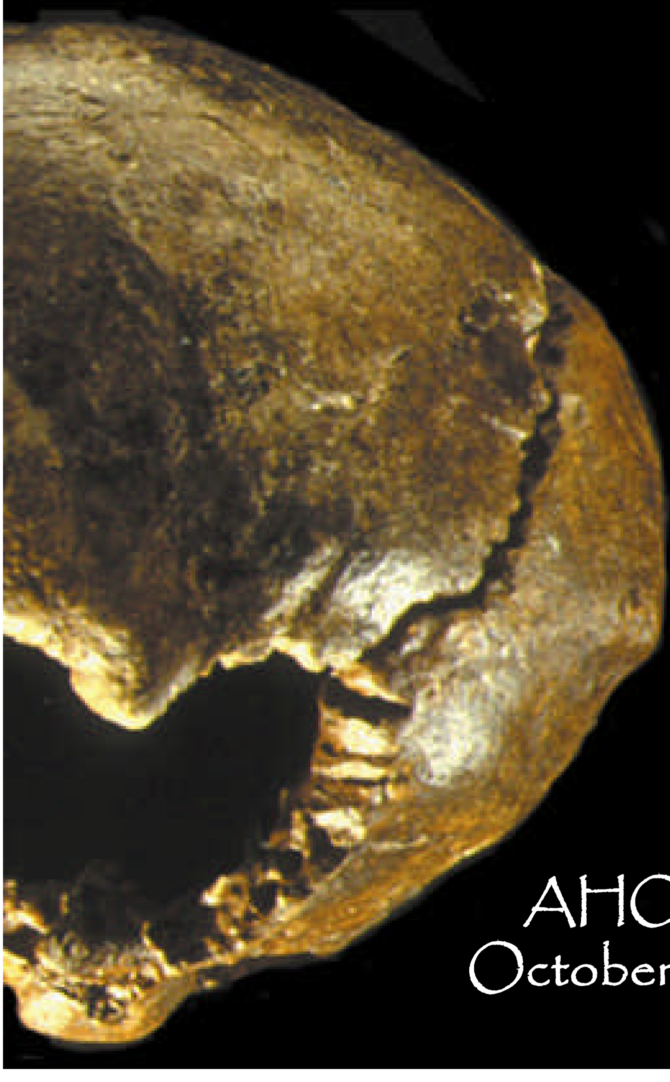


First Workshop of AHOB2: Ancient Human Occupation of Britain and its European Context



Edited by
Chris Stringer and Silvia Bello

AHOB, London
October 10-11th, 2007

First Workshop of AHOB2:
Ancient Human Occupation of Britain and its European Context

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AHOB2 Workshop

Franks House (38-46 Orsman Road London N1 5QJ)

October 10-11th 2007

Wednesday 10th October

10:15 Welcome from Chris Stringer and Nick Ashton

Session 1: *The earliest occupation of Europe*
Chair: Wil Roebroeks

10:30	Geomorphological dating of Early Middle Pleistocene sites.	J. Rose
10:50	Water vole tooth (*Arvicola*) morphology: exploring shape to examine evolution.	M. Ruddy
11:10	***Coffee***	
11.30	Preliminary results from recent fieldwork at Benacre, Suffolk	S. Lewis, S. Parfitt, N. Ashton
11:50	The stratigraphy at Fakenham Magna and Flixton: AHOB sites in East Anglia.	J. Rose
12:10	Early Middle Pleistocene Landscapes of Suffolk: The Environmental Archaeology of Flixton Quarry.	B. Silva, D. Schreve, I. Candy, M. White, J. Rose
12:30	Parallelism on the dispersal of the Acheulian culture and the genus *Bos*.	B. Martínez-Navarro, J. Pérez-Claros, M. Palombo, L. Rook, P. Palmqvist
12:50	**Lunch at Franks House**	
14:00	Pagliare di Sassa: an early Middle Pleistocene site in central Italy	Mussi M., Palombo M.R., Agostini S., Barbieri M., Di Canzio E., Fiore I., Iacumin P., Novelli M., Tagliacozzo A.

14:20	Unravelling Genetic, Environmental and Age-related signals in Microtus dentition.	L. Killick
14:40	The fire history of the Hoxnian.	S. Forden
14:50	"No man is an Island": AAR in Europe	K. Penkman

15:10 ***Discussion***

16:00 **Tea break**

Session 2: *New technologies: the Middle Palaeolithic revolution*

Chair: Clive Gamble

16:20	Recent work at Crayford.	B. Scott
16:40	Constraints on Neandertal range limits: a study from northwest European data.	A. Jagich

17:00 ***Discussion***

Session: *Poster and Demonstration 1*

Chair: Jim Rose

17:20	Climate change and Human occupation during the early Middle Pleistocene: Global records of long term change.	I. Candy
	Climate change and Human occupation during the early Middle Pleistocene: The terrestrial record of Britain	I. Candy
	The Cromerian landscape: Environments of Europe's earliest inhabitants.	B. Silva, J. Rose
	Micromorphology of cut-marks on large mammal remains from Boxgrove, West Sussex, England.	S. Bello, S. Parfitt

18:00 Refreshments and buffet meal (Farringdon, details to follow)

Thursday 11th October

Session 3: ***Island Britain***
Chair: Mark White

10:00	The Banwell Bone Cave MAZ and its placement in OIS 5a.	A. Currant
10:20	Testing human absence: results of recent fieldwork at the Last Interglacial site at Saham Toney, Norfolk.	S. Parfitt, S. Lewis, N. Ashton, S. Forden, R. Preece, K. Penkman
10:40	The Caours Tufa (Somme, France): evidence from an Eemian sequence associated with a Palaeolithic settlement	J.-L. Locht, P. Antoine, P. Auguste, N. Limondin-Lozouet
11:00	***Discussion***	
11:20	***Coffee***	

Session 4: ***Cultural complexity and dating humans during and at the end of the last glaciation***
Chair: Tom Higham

11:40	Isotopic evidence of Neanderthal diet and mobility	M. Richards
12:00	The Avifauna of North-Western Europe during OIS 3: the Bird Remains from the Middle Palaeolithic horizon of Pin Hole Cave, Derbyshire, England	J. Stewart, R. Jacobi
12:20	New research on the Kent's Cavern 4 maxilla, its context and dating.	C. Stringer, R. Jacobi, T. Higham
12:40	Refining the chronology of the early Upper Palaeolithic in Britain and western Europe.	R. Jacobi
13:00	***Lunch***	
14:00	Reassessing the diet of Upper Palaeolithic humans from Gough's Cave and Sun Hole Cave.	R.E. Stevens, R. Jacobi, A. Currant, T. Higham

14:20	Human response to Late Glacial climatic fluctuations: the sequence of Grotta di Pozzo (42°N).	M. Mussi, E. D'Angelo, I. Fiore, R. Melis
14.40	Final Palaeolithic technical economies in Britain	C. Conneller
15:00	***Discussion***	

Session: ***Poster and Demonstration 2***
Chair: Chris Stringer

15:20	Neanderthals in Acton	B. Scott
	Initial excavations at Sproughton; environments of human occupation during the Lateglacial/Early Holocene	R.S. Sowa, I. Candy, J. Rose, D. Schreve, R. Jacobi.
	The AHOB2 Database.	D. Polly and S. Bello
16:00	***Final Discussion and Tea***	
17:00	**Meeting finishes**	

Abstracts

Session 1
The earliest occupation of Europe

Geomorphological dating of Early Middle Pleistocene sites

Jim Rose

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This presentation aims to outline the concept that in temperate-latitude regions, substantial river aggradations can be been related to eccentricity-forced (c. 100 ka frequency) Milankovitch climate change, and that as Milankovitch climate changes can be timed by reference to mathematically calculated orbital forcing these climate changes can provide a timescale for Quaternary science. Roughly, one aggradation equals 100 ka of time.

The key element of this proposition is that, in cool temperate latitudes physical processes (gelifraction and gelifluction, with perhaps glaciation in headwater regions) that operate in the colder parts of Milankovitch cycles drive the erosion in the upper parts of the catchment and deposition in the lower reaches; whereas in the temperate parts of the Milankovitch cycles physical processes are much diminished and vegetation cover (especially woodland with dense undergrowth) stabilises slopes and locks-up the available sediment. The consequence of these climate-forced processes is that abundant sediment is moved through river systems in the colder episodes with consequential major landscape change (erosion in the headwaters and on slopes and deposition in the lower sections of the valley bottoms and at coastal regions) and material (with the exception of chemically produced fine-grained fraction) is locked onto the slopes in the temperate episodes so that river energy is concentrated on eroding the river channel.

In its most simple expression this can mean that river systems aggrade in cold episodes and incise in temperate episodes, and this has become known as the ‘Bridgland Model’. This model has been developed from evidence in a large number of catchments and has been tested against available geochronometry and available biostratigraphy in the form of mammal and mollusc assemblage stratigraphy back to c. 450 ka BP. The Bridgland Model has been explained (Bridgland, 2000, 2006) in complex detail, giving attention to both the short-term changes and the longer-term net effects, and hitherto, the scheme can be found to explain most of the changes recognised in Quaternary fluvial successions (Rose, 2006).

Although the scheme is applicable to river catchments irrespective of whether a site is subsiding or uplifting, it can only be used for chronological purposes if the river catchment has been undergoing long-term uplift and has therefore produced a set of river terraces (net aggradations/ net incisions). Fortunately, as a consequence of erosional isostasy, this is the case in much of cool temperate northern Europe where upland areas have risen significantly during the later parts of the Pleistocene. Thus river systems such as the Thames, Bytham, Solent and Somme have well developed aggradations, as does the Rhine upstream of the delta region. However in areas like northeast Norfolk, where there does not seem to have been significant uplift over the same period of time, there are no net-aggradations and a very complex pattern of channelling and small-scale aggradation is the case. This means that in areas such geomorphological dating cannot be applied, and very detailed sedimentology, fluvial geomorphology and litho and biostratigraphy (as well as geochronometry if available) will be needed to derive a chronology.

This presentation attempts to explain the geomorphological processes that are related to climate and drive aggradation and incision in the different parts of the catchment. The explanation is found in the distribution of stream power ($\Omega = \rho gQS$, where Ω = stream power, ρ = density of the fluid, g = acceleration due to gravity, Q = discharge, S = slope) (Bagnold, 1960) throughout a catchment with maximum work done at the inflection between the steep upper part of the long profile and the low gradient lower part of the profile. The presentation also seeks to explain the difference between ‘small-scale’ changes in river processes and ‘small-scale’ river landforms due to complex response (Schumm, 1973) in which an internal effect (autochthonous) such as the development of a coarse-grained bed caused by local geology may lead to downstream channel incision, or allochthonous effects such as local glaciation in the catchment will lead to local aggradation and the development of multiple terraces. A number of cases of ‘small scale’ variations in river activity are outlined, and an attempt is made to identify when the amalgamation of the ‘small-scale’ processes is sufficient to produce the ‘catchment representative’ net aggradation. Attention is also given to the difference between a river terrace (landform) which may have only local significance and a catchment-representative net aggradation.

The quality of this method of geomorphological geochronometry is evaluated relative to other Quaternary geochronological methods (pollen, mollusc and mammal assemblage biostratigraphy, FAD/ LAD biostratigraphy, OSL, AAR, U-Series) and it is concluded that this geomorphological method has a robustness that is rarely found in other methods, but has a very low resolution, although surprisingly, not lower than most of the other methods cited above. A plea will be made that other methods (pollen, mollusc and mammal assemblage biostratigraphy, FAD/ LAD biostratigraphy) <u>explain the science (ecology) behind</u>

their methodology rather than depend on an empirical reasoning that is subject to circular argument and liable to falsification with each new observation.

Other geomorphological processes respond to climate change on similar timescales: glaciation extent and sea-level and therefore have potential to be used for geochronometry, but these are not, because of the time available, considered in this presentation.

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Water vole (*Arvicola*) tooth morphology: exploring shape to examine evolution

Mark Ruddy

Royal Holloway, University of London, Egham, Surrey TW20 0EX

The water vole (*Arvicola*) is a common component of Middle and Late Pleistocene faunas from the western Palaearctic. Quantitative studies of tooth morphology in fossils have revealed a number of trends in dental evolution that lend the genus biostratigraphic significance. Chief amongst these metrics is the molar tooth enamel thickness quotient (SDQ), which not only shows morphological change through time but also geographic variation between species/subspecies.

Given the problems encountered in dating terrestrial deposits from the Middle and Late Pleistocene, improvements to the precision and accuracy of chronologies based upon the evolution of *Arvicola* would be of general benefit to Pleistocene research. This paper presents an ongoing study that seeks to explore the evolution of *Arvicola* primarily through geometric morphometric (GM) techniques. GMs uses mathematical definitions of shape to analyse biological structures; an approach that has been shown to resolve morphologies more clearly than studies which employ measurement based morphometrics (e.g., measures of tooth length and tooth width). Furthermore, because there is strong genetic control on tooth morphology, the application of GMs to dental evolution allows putative phylogenies to be built, and also permits the data that describe tooth shape to act as proxy data in models of population level genetic processes. By using GM, allied with other morphological evidence such as that from the SDQ, it is hoped that a greater understanding of temporal and spatial patterning between populations will develop. Such patterns can then be compared with pre-existing ideas of evolution and dispersal to give insights that are likely to impact upon the use of *Arvicola* as a dating tool.

Preliminary results from recent fieldwork at Benacre, Suffolk

Simon Lewis[1], Nick Ashton[2] and Simon Parfitt[3, 4]

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Recent discoveries, by a local collector, of Lower Palaeolithic artefacts derived from coastal exposures at Benacre, Suffolk have been reported to members of the AHOB project. A field visit in May 2007 has enabled the stratigraphy of the site to be recorded and the source of the artefacts to be determined. Preliminary results of this fieldwork and subsequent analyses will be presented.

The site lies on the coast c.2km east of the village of Benacre and some 8km south of the important Palaeolithic site at Pakefield. To the south are the key localities of Covehithe and Easton Bavents, which have been received considerable attention and from which faunal remains have been collected for many years.

The stratigraphy at Benacre can be divided into four lithofacies; Bcr-A to D. The sedimentological and bulk lithological characteristics of each of these will be briefly described and their correlation with deposits up and down the coast will be considered.

The artefact assemblage consists of bifaces and flakes. The fieldwork, which included sieving of sediments from which the initial discoveries were made, confirmed the presence of artefact material within lithofacies Bcr-D. The nature of this small assemblage will be considered. Finally the age and wider implications of the Benacre assemblage will be discussed.

The stratigraphy at Fakenham Magna and Flixton: AHOB sites in East Anglia

Jim Rose

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Email: j.rose@rhul.ac.uk and jrose@dircon.co.uk

This presentation outlines the stratigraphy at Fakenham Magna and Flixton, two sites investigated as part of the AHOB project. Both sites are still under investigation as far as the archaeology is concerned, but the stratigraphic studies are complete. This review of the stratigraphy will provide a context for the archaeology.

The site at Fakenham Magna is south of Thetford in Suffolk, and was studied with the assistance of Mark Stephens, Carline Juby and Adrian Palmer. The potential archaeology at the site has been studied by Nick Ashton and Roger Jacobi and this work is still ongoing. The geology at Fakenham Magna involves gravels of the Bytham River, system two palaeosols and two tills.

Sediment	**Soil**	**Process of formation**	**Environment and climate**	**Correlation and possible age**
Chalky till		Glacial deposition with erosion and entrainment of underlying soil and till	Glaciation	Similar to Lowestoft Till (assumed MIS 12 (c. 0.46-0.43 Ma BP)
	Argillic horizon of soil with clay skins (visible in field and thin section and carbonate concretions	Chemical weathering and translocation	Warm temperate climate with periods of P>E and P<E.	This is a first observation and appears to have formed between MIS 16 and 12
Sandy till		Glacial deposition with erosion of top of underlying soil	Glaciation	Similar to Happisburgh/ Corton Till (likely MIS 16.2 (c. 0.67-0.62 Ma BP)
	Thick (>2.5m) Bt horizon of argillic soil	Extreme chemical weathering and translocation	Warm temperate climate with positive P>E	Equivalent to Valley Farm Soil and representing many periods of warm temperate climate
Quartzose rich sand and gravel with intraformational ice-wedge cast ***This unit host the possible archaeology***		Braided river deposition	River aggradation in permafrost climate	4th aggradation of Bytham River = MIS 18.2-18.4 (c. 0.72-0.75 Ma BP)*

The stratigraphy, environment and likely age of the succession at Fakenham Magna is given in the table below and the description and interpretation will be elaborated in the lecture

The site at Flixton is southeast of Bungay in Suffolk, and was studied with the assistance of Katrien Heirman, Amanda Ferguson and Mark Lewis. The archaeology and sedimentology associated with the archaeology at the site has been studied by Danielle Schreve, Barbara Silva and Ian Candy and this work is still ongoing. The geology at Flixton involves gravels of the Wroxham Crag shallow marine system, an organic deposit, two tills and two outwash deposits.

The stratigraphy, environment and likely age of the succession at Fakenham Magna is given in the table below and the description and interpretation will be elaborated in the lecture. It should be noted at this stage that it is not possible to make an estimate of the age of the archaeology other than that it is older than the sandy till which is likely MIS 16.

Sediment and landform (where appropriate)	Soil	Process of formation	Environment and climate	Correlation and possible age
	Complex argillic and physically deformed soil	Chemical and physical soil processes	Temperate and cold climates	Younger than the outwash parent material
Coarse sand and gravel forming a valley-bottom sandur		Meltwater river deposition	Glaciation with meltwater from up-valley ice source	Possibly related to Lowestoft Till but could be younger
Chalky till		Glacial deposition	Glaciation	Similar to Lowestoft Till (assumed MIS 12 (c. 0.46-0.43 Ma BP)
Sand and gravel		Meltwater river deposition	Glaciation with meltwater from ice sheet	Appears to be outwash from ice that deposited overlying till
Sandy till		Glacial deposition with erosion of underlying sands and gravel	Glaciation	Similar to Happisburgh/ Corton Till (likely MIS 16.2 (c. 0.67-0.62 Ma BP)
Quartzose rich sand and gravel sands and silts and an organic bed. ***This unit hosts the archaeology***		Sand and gravel bars with fine grained swale sedimentation	Tidal current deposition – likely in a temperate climate because of sea-level at time. Ephemeral river channel deposition.	Equivalent to Wroxham Crag, but this has a very wide age range and estimation of age not possible

Correlation between the sites is possible by linking the sandy and chalky tills.

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Early Middle Pleistocene Landscapes of Suffolk: The Environmental Archaeology of Flixton Quarry.

Barbara Silva[1], Danielle Schreve[1], Ian Candy[1], Mark White[2], Jim Rose[1]

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2. Department of Archaeology, University of Durham.

This presentation will report on the preliminary evidence for early humans and their environmental context as recorded at Flixton Quarry (RMC Aggregates Ltd Site, TM 2956 8643), an (*ca.*1km^2) active sand and gravel quarry in Suffolk, East Anglia. Fossiliferous sediments were exposed at the site in early 2007. Sedimentological analysis indicates that the organic unit is a pool infill at the base of a large bar (mega-ripple) likely to have been formed by tidal current flow in a shallow marine context (cf. Wroxham Crag), a context discussed in more detail by J. Rose (this meeting). Preliminary investigation of this deposit has revealed evidence for a temperate climate, with a mosaic landscape of woodland and open grasslands (pollen and plant macrofossil analysis), inhabited by a diverse faunal assemblage (including small mammals, occasional large mammal remains, fish and beetles). The presence of early humans is inferred from >60 flakes and cores in exceptionally fresh condition, *in situ* in association with the channel.

Parallelism on the dispersal of the Acheulian culture and the genus *Bos*.

Bienvenido Martínez-Navarro[1], Juan Antonio Pérez-Claros[2], Maria Rita Palombo[3], Lorenzo Rook[4] and Paul Palmqvist[2]

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The origin of the genus *Bos* is a debated issue. From ~0.5 Ma until historic times the genus is well known in the Eurasian large mammal assemblages, where it is represented by *Bos primigenius*. This species has a highly derived cranial anatomy that shows important morphological differences from other Plio-Pleistocene Eurasian genera of the tribe Bovini such as *Leptobos, Bison, Proamphibos-Hemibos,* and *Bubalus*. The oldest clear evidence of *Bos* is the skull fragment ASB-198-1 from the Middle Pleistocene (~0.6-0.8 Ma) site of Asbole (Lower Awash Valley, Ethiopia) (Geraads *et al*. 2004). The first appearance of *Bos* in Europe is at the site of Venosa-Notarchirico, Italy (~0.5-0.6 Ma) (Cassoli *et al.* 1999). Although the origin of *Bos* has traditionally been connected with *Leptobos* and *Bison,* after a detailed anatomical and morphometric study we propose a different origin, connecting the Middle Pleistocene Eurasian forms of *B. primigenius* with the African Late Pliocene and Early Pleistocene large size member of the tribe Bovini *Pelorovis sensu stricto* (Martínez-Navarro et al. 2007). The dispersal of the *Bos* lineage in Western Europe during Middle Pleistocene times seems to coincide with the arrival of the Acheulean tool technology in this continent.

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Pagliare di Sassa: an early Middle Pleistocene site in central Italy

Mussi M.[1], Palombo M.R.[2], Agostini S.[3], Barbieri M.[2], Di Canzio E. [2], Fiore I.[4], Iacumin P.[5], Novelli M.[2], Tagliacozzo A. [6]

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In 1997, fossil remains of a large elephant were discovered in a sand quarry at Pagliare di Sassa (L'Aquila, Central Italy). Preliminary investigations carried out in 1998-1999 by the Soprintenza Archeologica dell'Abruzzo, with the collaboration of the Museo di Paleontologia (Università degli Studi di Roma "La Sapienza") and of the Università degli Studi de L'Aquila, led to the discovery of fossiliferous horizons (Agostini *et al.* 1999).
The fossil-bearing sequence takes the shape of an alluvial fan deposit with grey basal clays which were cut into by a channel. The latter is filled with a sequence of sandy lenses with fine gravel intercalations, that at times fit into each other and pass laterally to form regular plane-parallel beds. In 2000, systematic excavations at the site has unearthed a number of vertebrate fossil remains. There is evidence of localised reworking and re-deposition (Palombo *et al.* 2001), but overall they that have undergone only limited transport by a low energy agent.

The faunal remains so far identified include; *Lepus* sp., an undetermined carnivore (?*Crocuta*), *Mammuthus* sp., ?*Elephas (Palaeoloxodon) antiquus, Stephanorhinus hundsheimensis, Hippopotamus* ex gr. *H. antiquus, Sus scrofa, Megaloceros savini, Praemegaceros verticornis.* Scanty remains belong to *Mimomys savini* and to *Microtus gregaloides*.

Human presence is evidenced by a flake (37x37x7mm) discovered at the bottom of the fossil-bearing sequence. Rather poor quality flint was used to produce it, but it is rather thin with an even cross-section. Trampling and/or water transport damaged the edges, and breakage alternate with pseudo-retouch all over the periphery of the implement. Accordingly, the platform cannot be any more observed, while on the ventral face the bulb and ripple scars are easily identified. No cortex is left, and the dorsal scars evidence the preliminary removal of a minimum of 3 flakes, from two opposite directions.
The fragmentary femur of a mammal of the size of a giant deer also displays probable evidence of human signature. On the inner surface of the dyaphisis, two opposite negative scars can be seen, which are suggestive of percussion and breakage. Hakle marks and ribs are further indicative of green bone.

REMARKS

Paleomagnetic surveys have consistently registered normal magnetic polarity in the basal clays (Speranza, unpublished data). The co-occurrence of *Mimomys savini* and of *Microtus (Steniocranius) gregaloides,* point to an early Middle Pleistocene age (*Mimomys savini* and *Microtus gregaloides* zone, Fejfar and Heinrich, 1999). The value of the SDQ index (average ratio of the concave and convex band enamel thickness= 142) and the length of the occlusal surface (L =3,38 mm) fall into the variability range of specimens whose age is correlated with the early Brunhes magnetochronozone, i.e. the latest Biharian (Maul *et al.*

1998). In Italy *Megaloceros savini* co-occurs with *Praemegaceros verticornis* only in the Ponte Galeria local fauna at c. 750 ka (Milli,1997).
Strontium isotope analysis of bone samples give consistent values of 0,70 991 +/- 0,00002. These values cannot have been originated by the carbonatic soils widely cropping out in the area. They are consistent with values for animals pasturing on volcanic deposits. Magmatic local events occur at c. 600ka (Barbieri et al.,2002), giving a maximum age for the fauna.
Seven samples of mammal bones were measured for their C and O stable isotope composition on bone apatite. The carbonate $\delta^{13}C$ values vary from -5.9 to -9.6 ‰ with a mean value of -7.6‰. Using the carbon isotope fractionation proposed by Cerling and Harris (1999), the calculated mean values for diet is -21.7 ‰, which represents essentially a pure C_3 diet and points to environmental conditions more arid than today. The carbonate $\delta^{18}O$ values vary from 23.6 to 27.0 ‰ with a mean value of 25.8 ‰, indicating that is was colder as well.

An early Middle Pleistocene age is assessed for this archaeological and palaeontological site in the inner part of peninsular Italy. Ongoing research will further refine the chronology, possibly confirming a relatively late persistence of *Mimomys savini* and *Praemegaceros verticornis*.

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Unravelling Genetic, Environmental and Age-related signals in Microtus dentition.

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The genus *Microtus* provides an important resource for Palaeontologists and Evolutionary Biologists to help in piecing together past environments, population histories and environmental change. Vole species display extremely rapid dental evolution, with the same amount of evolution occurring during the Pleistocene as the entire of the Tertiary period, faster than any other known species (Guthrie, 1965). This rapid dental evolution is of particular interest to Palaeontologists, as teeth are one of the denser skeletal elements, and are more resistant to chemical decay and breakage than bone. Therefore, they survive well within the palaeontological record for long periods of time, making studies of evolution and change possible overlong periods, including the possibility of tracking change throughout the Pleistocene. Within populations of *Microtus*, there is a widely varying amount of morphological variation. The factors which affect and cause these morphological changes however, are less well understood. In order to understand morphological changes within *Microtus* teeth, the factors which effect and cause these changes, and defining which morphological characters change and in which way they are changed by different external factors is extremely important.

One factor which is thought to affect the range of variation within a *Microtus* population is the amount of competition from other *Microtus* species. With populations containing only a single species of *Microtus* displaying a much greater range of variation than those containing several species. (Currant, pers. Comms).
The British sites of Westbury Sub-Mendip and Boxgrove are extremely well studied and important sites, and both contain large quantities of small mammal remains, including *Microtus* and are used to test the affects of competition on the amount of variation observed within populations of *Microtus subterraneus/ Pitymys arvaloides* using geometric morphometric outline analysis techniques on lower first molars (M_1 s.)

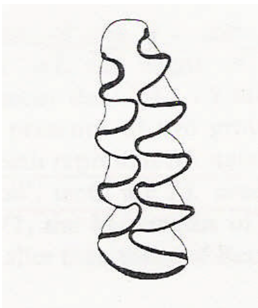

Figure 1: *M. subterraneus* M_1 (Miller, 1912)

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The fire history of the Hoxnian

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Orbital parameters during the Hoxnian (Marine Isotope Stage 11) make this interglacial potentially a good analogue for the present interglacial. Therefore a greater understanding of the environmental changes of this period afford an opportunity to shed greater light on more recent environmental changes.

Fire is one of the most important ecosystem process and a vital part of the earth system. Reconstructing palaeo fire activity provides a significant long term perspective but has primarily been restricted to the Holocene. The present study presents one of the first Pleistocene fire histories, from an interglacial with considerable environmental significance. Furthermore, inferences from charcoal records during the Mesolithic and Neolithic have led to the interpretation of significant human activity. The possibility of applying these inferences to the Palaeolithic is intriguing.

Preliminary charcoal and pollen results are presented from a new Hoxne core and the possibility of detecting early human impacts on the landscape will also be discussed.

"No man is an Island": AAR in Europe

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Isolation of the intra-crystalline fraction within shells results in a closed system of protein, with marked improvements in the application of amino acid geochronology. Analysis of D/L values of multiple amino acids from the chemically protected organic matter within the biomineral enable both decreased sample sizes and increased reliability. However, it is with the recognition of the robustness of calcitic opercula that amino acid racemization (AAR) has come into its own, pushing back the range of this technique far further than expected. The first results of the extension of the UK aminostratigraphic framework into Europe are presented, including key archaeological sites. Whilst the limits of dating using solely racemization is reached within the Pliocene in the areas studied, the isolation of an intact closed-system of amino acids from Miocene and Eocene opercula opens up a world of other amino acid degradation reactions which can be used for dating.

Session 2
New technologies: the Middle Palaeolithic revolution

Recent Work at Crayford

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The Palaeolithic settlement history of the British Isles has, in recent years, become an increasingly significant arena of debate. A progressively robust chronometric framework now allows previously invisible patterning in technological behaviour, hominin habitat preference and demography during this period to be investigated. Analysis of artefacts numbers from terraces of the Ancient Thames have been used to model population density throughout the Middle Pleistocene, suggesting that MIS 7 (c.230-180 KBP) was witness to a dramatic crash, humans being absent from Britain by late MIS 7/ early MIS 6 (Ashton and Lewis 2002). This pattern may relate to changes in human habitat preference, humans increasingly beginning to exploit the productive, open environments such as would have prevailed during early MIS 7.

The site of Crayford in North Kent is central to such debates; here, expansive spreads of brickearth were extracted between the late 19th to early 20th century, producing a wealth of faunal and other environmental remains, together with exceptional collections of refitting Levallois artefacts (Spurrell 1880, Chandler 1914) – the only such assemblages known from this period in Britain. Whilst the brickearths themselves form part of the Taplow-Mucking terrace of the Thames (MIS 8-7-6), comparatively little is known of the specific chronological and environmental context of the archaeological material. Analysis of faunal collections made from throughout the Lower Brickearths has been argued to indicate a late MIS 7/early MIS 6 date for the aggradation of these sediments – and hence for the archaeology contained therein (Schreve 2001). If this was the case, then clearly human were not absent from Britain by this stage. This paper presents the results of an extensive refitting study refitting study which has been undertaken using the material collected by Spurrell from Stoneham's Pit, together with the results of recent field investigations.

Constraints on Neandertal range limits: a study from northwest European data.

Adam Jagich

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Throughout the last 500,000 years European environments have changed several times in response to dramatic global climatic oscillations. Neandertals, like many other species reacted to these changes with a myriad of physical responses and by altering behavioral strategies. Establishing the timing, nature, ecological context and ultimate consequence of these responses is a key question in human evolution. Given the lack of absolute dates for Neandertal physical or cultural remains makes their correlation to the global climatic record or to local environmental reconstructions extremely difficult. A better understanding of the biogeographical distribution of Neandertals as well as the ecological principles that influence the edges of these ranges will provide a new research avenue into questions regarding the environmental preferences and tolerances of Neandertals in the European landscape.

The estimates and descriptions of the distribution of the Neandertals, (e.g. Stringer & Gamble, 1993; Gamble, 1999; Klein, 1999) state that their range covered Europe and restricted parts of the Near East. But what is the basis for these claims? Until now distribution maps have relied on diagnostic fossil evidence to construct their boundaries. Recent genetic evidence suggests that these approximations were drastically underestimated finding evidence of Neandertal DNA 2000 kilometers beyond the proposed margins (Krause *et al.* 2007).

Given the inherent problems of the fossil record such as taphonomy, research biases and recognition, should this record be used to construct models of species distribution? Our current estimates collapse the entire Neandertal evolutionary lifespan, (ca. 300,000 years (300 kyr.)) into one projection ignoring the ebb and flow of populations throughout their range over time. Often these dramatic movements in population are in response to large-scale changes in environment such as those brought on by the onset of glacial periods or the warming associated with interglacial cycles.

As the study of climatic and environmental history refines itself, archaeologists and paleoanthropologists have been more inclined to attempt to correlate patterns in the archaeological record with instances of climate change (Finlayson & Carrion, 2007; Jimenez-Espejo *et al.* 2007; Tzedakis *et al.* 2007). Studies such as these have proved inconclusive thus far. But, have we been asking the wrong questions of the data? Is the chronological resolution of either the climatic or the archaeological record good enough to correlate the two? Is it possible to see such singular and dramatic events as the first colonizers of the individual death, which also signaled the extinction of a species?

A range is defined as the entire geographical area over which a species occurs. With a species as adaptive as Neandertals this range covers several ecological zones over vast amounts of space in Eurasia. Ranges are typically complex and dynamic features whose boundaries have been defined as "abstracts of reality" as opposed to having fixed, visible margins (Gaston, 2003). Often these boundaries do coincide with those of a climatic zone, but this does not imply a causal relationship.

Factors involved in limiting a species distribution can be bifurcated into those which are external and impose an opposing force to range expansion. These include climate or ecological boundaries, physical barriers, resource availability and inter-specific interaction (i.e. competition, predator/prey relationships or parasites). The other factors comprise those forces pulling from within a species range generated by the species itself. These internal factors include a species' dispersal ability, behavior, population dynamics and genetics.

These factors work in combination to limit the expansion of a species. When these factors become overwhelming a group can suffer range contraction whose eventual end is extinction. Without a better understanding of the mechanisms involved with range dynamics and incorporating ecological and biogeographical theory into archaeological models it is impossible to comment on species distribution in any predictable fashion.

In order to approach a study such as this, which looks into the factors involved in limiting the distribution of a species and their archaeological visibility it is important to choose an appropriate area of research. Britain provides an excellent case study in that its geographic location places it not only on the physical edge of the Neandertal range, but its northerly latitude makes it vulnerable to the dramatic shifts in climate associated with the onset and retreat of glacial ice sheets. The history of research into the geological, climatic and the archaeological records of Britain provide an enormous amount of information for the peninsula/island. The large gaps that appear in the archaeological record of Britain allow questions to be asked regarding the environmental tolerances and geographical distribution of the Neandertals over time.

Future research will be conducted testing the visibility of such limiting factors as were discussed above. Britain provides an excellent microcosm of research, but must be contextualized against Northwest Europe in hopes of understanding range dynamics in the Pleistocene. This project aims to go beyond a correlation of archaeological events to the climatic records and begin to understand the mechanisms that drive the distribution of the Neandertals.

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Session 3
Island Britain

The Banwell Bone Cave MAZ and its placement in OIS 5a.

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Andy Currant will briefly review the progress made so far in establishing a likely age and possible environment likely for the Banwell Bone Cave mammal assemblage as represented in north west Somerset. The previous assignment of this assemblage to OIS4 seems untenable, and unlikely though it may seem, it is quite possible that this mammal assemblage, rich in bison and reindeer, represents substage 5a, the concluding temperate stage of the Last Interglacial complex. The project is ongoing.

Testing human absence: results of recent fieldwork at the Last Interglacial site at Saham Toney, Norfolk

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The Last Pleistocene Ipswichian interglacial Stage (MIS 5e) was a period of generally higher temperatures than at present and higher global sea levels. The palaeoenvironmental, palaeoclimatic and palaeogeographical evolution of the British Isles during the Ipswichian is reasonably well understood. Biological evidence shows that the Ipswichian, like other interglacial periods, supported a rich diversity of mammals and other resources capable of supporting a human population. However, this interglacial is exceptional in that it is the only interglacial period in the last 700, 000 years, when humans are believed to have been absent from the British Isles. All the archaeological sites previously thought to belong to this stage have now been reassigned to earlier periods, especially

MIS 7. Consequently, sequences attributed to the Ipswichian have become neglected from an archaeological standpoint because they are now assumed to be sterile. This has led to a reinforcement of the idea of a 'deserted Britain'. However, recent discoveries of archaeology in tufa sequences of MIS 5e age at Caours in Northern France means that we should be open to the possibility that some humans might have reached Britain at this time. Only by subjecting British sites to comparable archaeological scrutiny can we test this hypothesis. As part of the AHOB Project, a thick sequence of sediments that accumulated during the Ipswichian (~115-130 Kyr ago) and Devensian (~100-10 kyr) stages have been sampled from lacustrine and fluvial contexts exposed during excavations for a fishing lake at Saham Toney, Norfolk. The interglacial sediments are extremely fossiliferous and contain several species of mollusc (and other taxa) that no longer live in the British Isles. The overlying cold stage sediments, which do not form a continuous record, have yielded the remains of mammoth and other vertebrates, as well as shells and other invertebrates. Despite extensive searches for flint artefacts, the only convincing artefacts were found in the uppermost gravels, but they might well be Holocene in age. This is the first opportunity that the AHOB project has had in the field to test the interpretation of human absence at this time. As well as reviewing the palaeoenvironment and geology of the site, this contribution will examine critically the evidence for Late Pleistocene human absence in Britain in a wider European context.

The Caours Tufa (Somme, France): evidence from an Eemian sequence associated with a Palaeolithic settlement

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The new investigation lead on the tufa deposits of the River Somme basin, within the SITEP (CNRS) Program, have allowed the discovery of a new tufa sequence overlying an alluvial formation in low terrace position at Caours (Scardon valley). The tufa sequence is separated from the underlying periglacial alluvial gravels by fluvial calcareous silts overlain by a marshy soil and a thin peat layer (≤ 1cm). The tufa formation is mainly composed by paludal (marshy) soil facies showing numerous in situ incrusted vegetal remains and travertine concretions (stromatoliths). Downslope, looking to the present day valley the whole tufa formation quickly evolves toward typical fluvial facies including oncolithic sands and large scale cross beddings. The tufa sequence and the fluvial silts have provided abundant malacological faunas thathave allowed describing a climatic evolution contemporaneous of the initial phases of an interglacial, followed by a climatic optimum and then a decline of temperate conditions. The lower part of the tufa includes several organic horizons that have yielded numerous large mammals and rodent remains contemporaneous of the interglacial optimum previously evidenced by malacology.

Within these horizons, four Palaeolithic layers have been discovered in situ (two from the organic tufa layers, one at the top of the peat layer and one at the base of the marshy soil horizon) in association with interglacial large mammal remains showing evidences of human operation (systematic breaking of long bones and cut marks). Taking into account its relative position within the Somme terraces system, the U/Th TIMS ages (average : 122±4,5 ka BP from 5 TIMS dates) and the results of the various bioclimatic studies, the Caours sequence represents the first record of the Eemian interglacial in the Somme basin. In addition, the archaeological levels discovered at Caours are a unique example of Human occupation during the Last Interglacial in Northern France.

Session 4
Cultural complexity and dating humans during and at the end of the last glaciation

Isotopic evidence of Neanderthal diet and mobility.

Michael Richards [1, 2]

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2. Department of Archaeology, Durham University, South Road, Durham, DH1 3LE.

In this talk I will provide new evidence for Neanderthal diet and mobility based on recent isotopic analysis of three Neanderthals. First, I will discuss the growing body of data on isotopic evidence of Neanderthal diets, including new data from a late Neanderthal associated with MTA technology, from the site of Jonzac in southwest France, as well as studies of the type specimen, and a second individual, from Feldhofer Cave in Germany. Finally, I will present new research we are currently undertaking on isotopic evidence for Neanderthal mobility using strontium isotope (solution and laser ablation) analysis of tooth enamel. Specifically, I will present the results of a strontium isotope study of a Neanderthal tooth, and associated fauna, from the site of Lakonis in Greece.

The Avifauna of North-Western Europe during OIS 3: the Bird Remains from the Middle Palaeolithic horizon of Pin Hole Cave, Derbyshire, England

John R. Stewart[1] and Roger Jacobi[1,2]

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2. British Museum, 63 Great Russell Street London WC1B 3BF

The bird remains from Pin Hole cave, Derbyshire are re-analysed in the context of the new dating of the stratigraphy of the Armstrong excavation. The analysis is restricted to the material from the Middle Palaeolithic (OIS 3) levels of the cave because the upper fauna is now known to be mixed with Holocene material. The results confirm many of the taxa unexpected for a Late Pleistocene Glacial deposit including most unusually the Alpine Swift. The claimed Demoiselle Crane specimen has also now been relocated and will be re-analysed. The overriding result so far is that the avifauna of OIS 3 in England included taxa whose ranges today do not overlap making it a non-analogue community in common with many mammalian faunas of the time.

New research on the Kent's Cavern 4 maxilla, its context and dating.

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3. Oxford Radiocarbon Accelerator Unit, Research Laboratory for Archaeology, Dyson Perrins Building, South Parks Road, Oxford OX1 3QY

Kent's Cavern lies 2 km east of Torquay on the south Devon coast. The cave is famous for its history of exploration and excavation by pioneering archaeologists and geologists during the 19th century. The cave has Middle and Upper Pleistocene sediments, as well as Holocene deposits, which in places contain rich faunal and archaeological materials. The most recent large-scale excavations were by the Torquay Natural History Society between 1926-1941, and these commenced with the opening of a line of contiguous trenches along the wall of the Vestibule furthest away from the entrance. They were later extended into the North-east Gallery, directly beneath where Pengelly had found Magdalenian artefacts in his early excavations. The greatest depth reached by these new excavations was 23' (7.01 m), in Trench C (depth was measured from remnants of the Granular Stalagmite, which seals the Pleistocene sequence). The deposits encountered were described as a Cave-earth, and in Trench C this was divided by a 'Stalagmite Floor' at a depth of 8' (2.44 m).

Upper Palaeolithic artefacts were found in the Cave-earth above this stalagmite. Tool-forms include end-scrapers and burins, and cultural attribution of this material is difficult. However the presence of shouldered scrapers and a carinated burin, as well as the pattern of the blade debitage, could suggest that it is Aurignacian. The only artefacts from beneath the Stalagmite Floor in Trench C are a small number of Upper Palaeolithic blades from cores with single or opposed platforms.

The human right maxilla (KC4) was found on 14 March, 1927 at a depth of 10'-6″ (3.23 m) in Trench C. This was described by Sir Arthur Keith in the same year, and he reported that three teeth were in place – the canine, second premolar and first molar, with empty sockets for the first premolar and second molar. Keith suggested that the maxilla was from a middle-aged male individual, and reported the crown and root dimensions of the three teeth, and the total length of the tooth row as preserved. He found that the measurements were entirely comparable to those of recent humans, and confidently stated "one can say with assurance that the specimen now described could not be derived from an individual of the Neanderthal type". Since 1927, the sample of Neanderthal and early Upper Palaeolithic humans has grown significantly compared with those known to Keith, and many new techniques of study have been developed. Thus it is timely to reassess his conclusions about the Kent's Cavern maxilla in terms of its morphology, the teeth represented, and its affinities, particularly given emerging information about its dating and probable archaeological associations.

Bone from the maxilla was sampled for radiocarbon accelerator dating in 1985, and published in 1989, giving a result of 30,900 ± 900 (OxA-1621) suggesting that this was one of the oldest modern human fossils directly dated up to that time. However, bones and teeth from above and below the reported depth of the maxilla have recently been radiocarbon dated using ultrafiltration (see table below) and these would seem to indicate an older age of between 35-37 kyr BP. The deepest Upper Palaeolithic artefact from this trench was found at 15′-0″ (4.57 m). In closely adjacent trenches excavated between 1934-1938 and using the same datum, Middle Palaeolithic artefacts were recovered from depths between 13′-9″ (4.24 m) and 17′-6″ (5.36 m). Therefore, there is the possibility of an overlap between Early Upper Palaeolithic and Late Middle Palaeolithic materials in the lowest part of the Upper Palaeolithic range. This is taken to be the explanation for the older ^{14}C determinations between 13′-3″ (4.05 m) and 15'-0 (4.57 m). The deepest sample, a radius of reindeer (OxA-14714), was found deeper than any of the artefacts in this part of the cave which include Middle Palaeolithic as well as Upper Palaeolithic artefacts.

Depth	Element/species	Pretreatment code	OxA number	Radiocarbon age BP	CN	$\delta^{13}C$	$\delta^{15}N$	Wt.% collagen	%C
8′-3″	Coelodonta antiquitatis, right metacarpal 3	AI	3450	34 620 ± 820		−19.7		1.00	42.5
		AF*	13 921	36 040 ± 330	3.4	−19.6	6.4	5.50	36.6
	Coelodonta antiquitatis, right metacarpal 4	AI	3449	34 500 ± 800		−19.3		3.90	41.0
		AF*	14 210	36 370 ± 320	3.3	−20.1	7.1	6.00	44.5
		AF*		35 650 ± 330	3.3	−19.4	7.4	5.00	43.6
9′-0	Ursus arctos, left dentary	AF*	14 059	35 600 ± 700	3.2	−19.0	11.5	0.95	41.7
9′-6″	Coelodonta antiquitatis, cranial fragment	AI	6108	30 220 ± 460		−20.0		2.30	42.4
		AF	13 965	37 200 ± 550	3.2	−20.1	6.2	2.60	40.2
10′-6″	Homo sp., right maxilla	AC	1621	30 900 ± 900		−26.0		1.70	
12-13′	Coelodonta antiquitatis, distal right tibia	AF*	14 715	35 150 ± 330	3.3	−19.4	6.5	3.44	41.8
13′-3″	Panthera leo, left $\underline{C}$	AF	14 285	43 600 ± 3600	3.2	−17.4	13.3	0.44	54.7
14′-0	Coelodonta antiquitatis, left unciform	AF*	14 761	45 000 ± 2200	3.4	−19.9	6.4	1.70	42.0
15′-0	Rangifer tarandus, left dentary	AG*	13 589	37 900 ± 1000	3.1	−18.9	7.1	1.50	41.4
		AF	13 888	40 000 ± 700	3.3	−18.5	5.1	2.80	41.9
19-20′	Rangifer tarandus proximal radius	AF*	14 714	49 600 ± 2200	3.3	−18.6	5.4	3.12	40.3

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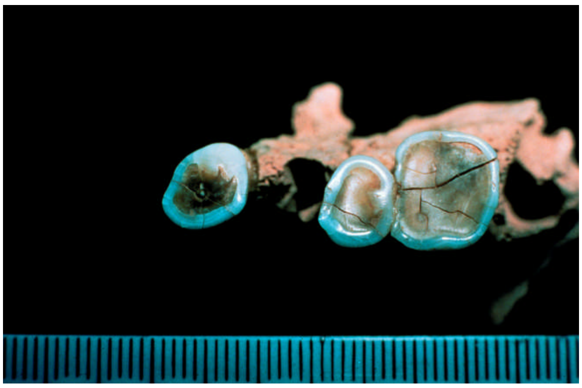
Flint and chert artefacts excavated from the Cave-earth elsewhere in Kent's Cavern have been attributed to the Middle Palaeolithic and the Initial, Early and Mid-Upper Palaeolithic. Cordiform and sub-triangular handaxes together with side-scrapers and flakes are probably attributable to a Mousterian of Acheulian Tradition for which an age between 40-60 kyr BP is inferred in the British Isles. Leaf-points ('Jerzmanowice' points) belong to the very beginning of the Upper Palaeolithic: at several British sites these have been found with large mammal bones, and the latter when radiocarbon dated have given ages of ~ 36-38 kyr BP. Aurignacian artefacts resemble some of those from Goat's Hole (Paviland) in south Wales where a presence of bladelet cores in the form of *burins busqués* suggests an evolved Aurignacian. Chronological information for the Aurignacian in Britain is confined to a single direct radiocarbon determination of ~ 32 kyr BP for part of an antler or bone lozangic point from Uphill, near Weston-super-Mare, in north Somerset. Other determinations for organic artefacts from the Hyaena Den, also in Somerset, and Pin Hole at Creswell Crags in Derbyshire confirm a human settlement event at this time. The Mid-Upper Palaeolithic is only represented at Kent's Cavern by a single broken 'Font-Robert' point of early Gravettian type.

Given the new indirect age estimate for KC4 of at least 35,000 radiocarbon years, it seems very probable that the fossil predates the British Aurignacian, and instead falls into the time range of leaf-points ('Jerzmanowice' points) belonging to the initial Upper Palaeolithic. The human type responsible for the production of these enigmatic artefacts is currently unknown, so reliably establishing the affinities of the KC4 fossil would be very significant in this regard. Ongoing collaborative studies of the specimen have included metrical, morphological, CT and ancient DNA investigations, and redating of a sample from the premolar root using ultrafiltration is in progress. Results so far will be discussed in the presentation.



Refining the chronology of the early Upper Palaeolithic in Britain and Western Europe.

Roger Jacobi[1,2]

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This brief paper explores the relationship of AHOB2 with a new collaborative project based in the Research Laboratory for Archaeology and the History of Art in Oxford. This three-year NERC-funded project has, as its objective, the investigation of the chronology of the Middle-Upper Palaeolithic transition in Western Europe. The principal investigators in this project are Tom Higham and Christopher Bronk Ramsey (University of Oxford), William Davies (University of Southampton) and Roger Jacobi.
This paper shows the ways in which this new research project bonds well with some of the stated objectives of AHOB2. Recent results of redating work at Goat's Hole (Paviland) will be presented.

Reassessing the diet of Upper Palaeolithic humans from Gough's Cave and Sun Hole Cave.

Rhiannon E. Stevens[1], Roger Jacobi[2], Andrew Currant[2] and Thomas Higham[3].

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Stable carbon and nitrogen isotope analyses of bone collagen are widely established techniques for reconstructing ancient human diets. However, within the last ten year it has become clear that substantial isotope analysis of accompanying fauna is required for accurate reconstruction of human palaeodiets as both significant intra-population variability due to physiological parameters and variability linked to climate have been reported. Therefore the isotope signatures of the underlying fauna in an ecosystem need to be established prior to interpretation of human isotope signatures.

On this basis it is necessary to reassess the dietary reconstruction of the Gough's Cave and Sun Hole Cave humans as the reconstruction was founded on isotope results from only five individual animals (Richards et al 2000). Marine protein has been reported to be a significant part of the diets of all of Upper Palaeolithic humans from the UK which have been isotopically analysed, with the exception of the humans from Gough's cave and Sun Hole cave. Richards et al (2000a) concluded that the protein consumed by the Gough's and Sun Hole cave humans was sourced primarily from terrestrial herbivores, mainly red deer, bos, and possibly reindeer. Horse however, was the most abundant species present at Gough's cave and reindeer were almost entirely absent. With extremely limited associated faunal isotope data and results contrasting to other Upper Palaeolithic humans in the UK it is clearly necessary to reassess this interpretation through further isotope analyses of associated fauna. During the last ten years the financial cost and the quantity of bone required for isotope analysis has reduced, thus allowing such further investigations. We will present the results of our further investigations.

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Human response to Late Glacial climatic fluctuations: the sequence of Grotta di Pozzo (42°N).

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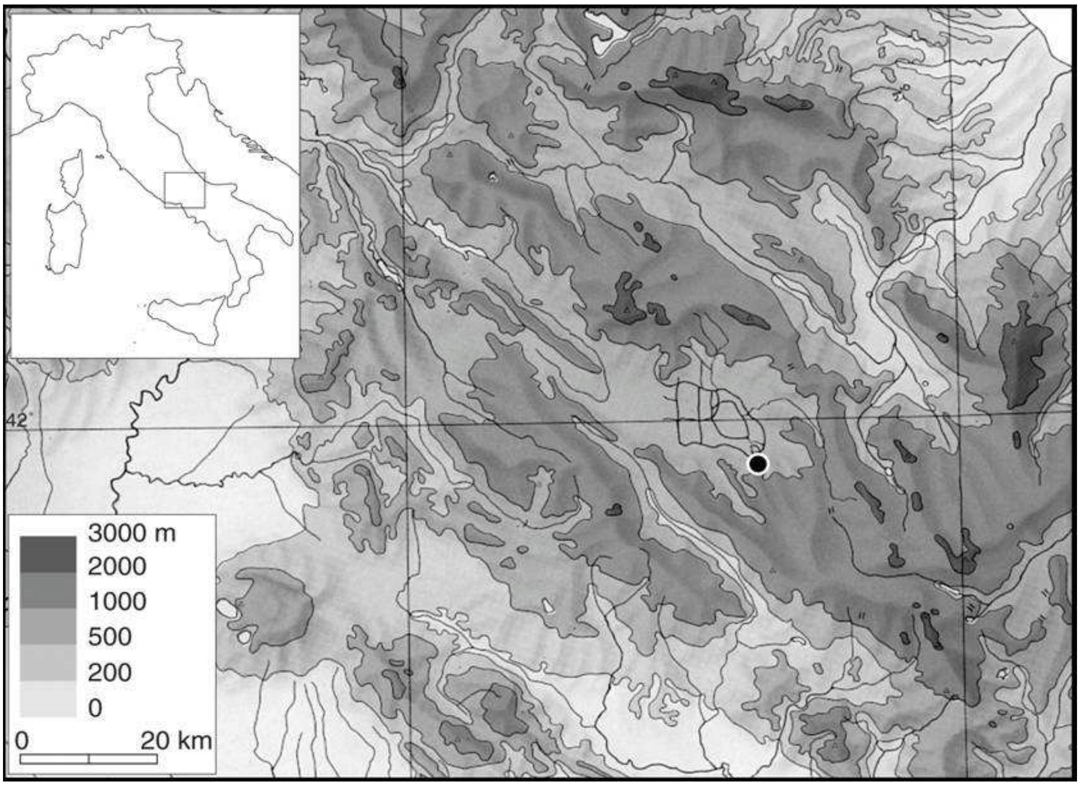
Grotta di Pozzo, at 710m asl and 42°N, is a cave of 12x6m in the limestone ranges of the central Apennines of Italy, 100 km East of Rome (Mussi et al. 2003). It opens at the southern edge of a basin of tectonic origin, surrounded by mountains which reach 1700-1800m within a few km and exceed 2000m asl. A plain currently exists at the flat bottom of the depression, but a shallow lake developed during most of the Upper Pleistocene, covering 150 km^2 in historic times, before land reclamation. The catchment area of the lake, named lake Fucino, was a closed drainage system of about 710 km^2. Lake Fucino levels widely fluctuated in response to changes in temperature and precipitation: high stands characterize cold phases, with low evaporation, being at the highest at the LGM, while the waters had almost entirely receded around 10,000 BP

(Giraudi 1998). Glaciers also developed in the mountains during the Upper Pleistocene. Being much smaller than Alpine glaciers, they reacted much more quickly to climatic fluctuations.



Grotta di Pozzo, accordingly, is set in an environment well-suited to allow fine-grained detection of environmental changes. Excavations were started to investigate the timing and mode of recolonisation of the central Apennines after the LGM. At the base of the deposit, fluvio-lacustrine pebbles and clays correspond to the LGM high stand of the lake. The archaeological sequence starts with layers including lithic industry of *Epigravettiano antico a cran* (Early Epigravettian with shouldered points), so far undated, but in the range of 16 to 18 ka BP following typological seriation. It continues with archaeological layers of Late Pleistocene age (15,790 ± 90 BP; 14,100 ± 70 BP; 12,590 ±40 BP; 12,320 ±50 BP). Holocene deposits include a shell midden with an early Mesolithic industry and dates in the range of 9.5-8 ka BP. The Late Pleistocene stratigraphic sequence is twofold: (1) between c. 16 and 13 ka BP, fine grained, compact detritic sediments, which are interbedded with thin organic lenses, and archaeological evidence suggestive of repeated if short-lived human occupation. Bone preservation is poor. (2) After 13 ka BP, coarse and loosely packed detritic sediments accumulated, including thick organic layers, related to human activity. The fauna is dominated by chamois, accompanied by ibex and red deer, while substantial fish exploitation also occurred (*Salmo trutta* - H. Russ pers. com. 2006).

Based on palaeoclimatic reconstructions for the central Apennines by C. Giraudi, between approximately 17.5 ka to shortly after 16 ka, at the time of the inferred earliest evidence of human activity at Grotta di Pozzo, the climate was comparatively mild, with a negative ΔT of <5.7 C° compared to present (Giraudi and Mussi 1999). At c. 16-13 ka, it was at first cold and wet, with glaciers advancing again, and a negative ΔT of approximately 6°C; and then cold and dry, with a negative ΔT of >5.4 C°. Between 13 and 11 ka, the climate was rather mild (negative ΔT of <4.8 C°). The twofold sequence of Grotta di Pozzo can be easily paralleled with the palaeoclimatic evolution of the general area. Repeated and short-lived human occupation occurs when the climate is cold, and dramatically increases when the latter turns to being relatively mild. This process fits into the model of Lateglacial recolonisation of Northern Europe put forward by Housley et al. (1997), which happened in two stages: a pioneer phase followed by a residential phase. The timing of the residential phase is the same in the Apennines, starting around 12,5-13 ka BP. The pioneer phase, however, starts much earlier and also lasts definitely longer.
The colonisation of mountain environments before 16 ka BP and soon after the LGM is unparalleled outside the Apennines. Explanations can be sough in the geographical setting, at comparatively low latitude, and at a short distance from lowlands and the Mediterranean shores. The favourable local conditions, with a large lake in the heart of the mountains, apparently created a unique set of opportunities for Late Pleistocene hunter-gatherers. The Fucino basin is an excellent locale in which to test models of a re-colonisation process which eventually spread widely throughout Europe.

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Final Palaeolithic technical economies in Britain

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This paper will investigate technical and mobility strategies at the end of the Upper Palaeolithic period, drawing, in particular, on a number of recently excavated British Final Palaeolithic sites. Final Palaeolithic technologies in northwest Europe have been characterised across as geared towards the relatively expedient use of local raw materials, particularly in contrast with the preceding Magdalenian (Fagnart 1997, Barton and Roberts 1996). Whereas Final Magdalenian industries were characterised by regularised schema operatoire, the use of exotic raw materials and a logistical settlement system, Final Palaeolithic schema operatoire were flexible, based on the use of poorer quality local raw materials and sites were small and relatively ephemeral. This strategy has been linked to the replacement of the large herds of horse and reindeer with the more solitary animals that favoured the emerging open birch woodlands of the Allerod.

However work by Floss (1991) and Street (1997) suggests more varied, and complex, strategies were in operation in Germany at this time, with a range of raw materials employed, often within a single site, from local materials to transfers of up to 100km. Street (1997), drawing on faunal evidence from some of these sites, suggests some of this variability may have been generated through seasonal movement, with non diverse lithic and faunal spectra indicative of winter activities and more heterogeneous and exotic lithics and fauna generated through summer activities. A closer look at both the Northern French and the British evidence also reveals variability. At Salaux (la Vierge Catherine), for example, the majority of raw material was immediately local, but a number of blades and tools were found in more a better quality raw material that was obtained from several kilometres distant, indicating differential transportation strategies. At Symmonds Yat East, Gloucestershire, raw material came from 50km away (Barton 1997).

This paper will discuss technical economies and mobility strategies at a number of newly excavated Final Palaeolithic sites in Britain (Seamer K, N. Yorks, Rookery Farm, Cambs. and La Sagesse, Hants.) in the light of this evidence. Refitting at these sites also suggests Final Palaeolithic technical economies in Britain were more varied and complex that previously imagined and took place in the context of high levels of residential mobility.

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Poster and Demonstration

Climate change and Human occupation during the early Middle Pleistocene: Global records of long term change

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Evidence for the earliest humans in northern Europe is found within deposits of the early Middle Pleistocene in eastern and central England (Parfitt et al., 2005). The climate of this period is crucial to our understanding of human occupation in northern Europe for two main reasons. Firstly, the frequency and severity of climate oscillations during this period may govern the ability of humans to occupy and survive in northerly latitudes. Secondly, an understanding of the climatic structure of the period is important for the development of a climatostratigraphy, an approach that has been very effective in understanding the timing and correlation of interglacial deposits in the late Middle and Late Pleistocene.

A review of the long term records of climate change that are currently available shows that there are four main types of proxy record that extend back through to the beginning of the early Middle Pleistocene (here considered to be the Brunhes-Matuyama boundary). 1) Benthic isotope records that record changes in *global* ice volume (predominantly driven by waxing and waning of the Laurentide ice sheet (Imbrie et al., 1984; Flower et al., 2000), 2) Records of sea surface temperature derived from either planktonic/benthic isotope calculations or foram assemblages (Becquey and Gersonde, 2002), 3) Isotopic records of changing *Antarctic* air temperatures from the EPICA ice core (EPICA, 2004), and 4) Palaeoecological records from southern Europe (Tzedakis et al., 2006). The first three of these record types are predominantly temperature driven, whilst the latter is predominantly a record of moisture availability which, within the context of southern Europe, has a temperature related control.

Two main points can be derived from this review. Firstly, records of global ice volume, sea surface temperature and Antarctic air temperature all record a *Mid-Brunhes event* (or MBE). The MBE represents the transition, at the onset of MIS 12, from low magnitude climate forcing, with interglacials appearing to be significantly cooler and glacials appearing less severe than those that occurred after MIS 12. Rather than interglacial/glacial cycles the climatic structure of the early Middle Pleistocene is more reasonable described as comprising two interstadial/stadial complexes, one comprising MIS 13/14/15 and one comprising

MIS 17/18/19, separated by a major global glacial event (MIS 16). During these interstadial/stadial complexes, global ice volume, using the analogue of the last glacial/interglacial cycle, never exceeds that present during MIS 3 but never decreases below the volume present in MIS 5a. MIS 16 is the exception and is characterised by an increase in global ice volume that is as extreme as any of the major glacial episodes that occur over the last 500,000 years. Only the vegetation record from Tenaghi Philippon in the eastern Mediterranean suggests that climate during interglacials of the early Middle Pleistocene was no different from that which occurred during interglacials of the late Middle and Late Pleistocene. However, it is important to remember that vegetation in the Mediterranean basin is primarily driven by moisture availability and not temperature, so this disparity may reflect different archives recording different aspects of the climate.

Secondly, if the records of global ice volume and sea/air temperature are considered to be a reliable record of climate over the past 800,000 years, it is clear that the conditions under which humans occupied Britain during the early Middle Pleistocene would be very different from those of the late Middle and Late Pleistocene. The absence of major interglacial peaks during the early Middle Pleistocene may indicate that warm episodes during this period were cooler than those that occurred during the late Middle and Late Pleistocene. However, average conditions during the early Middle Pleistocene were warmer and characterised by less severe oscillations. It is, therefore, possible that humans occupied northern Europe during a period of more stable climatic conditions when extreme cooling events were absent.

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Climate change and Human occupation during the early Middle Pleistocene: The terrestrial record of Britain

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The majority of long-term climate records suggest the existence of a *Mid-Brunhes event* (MBE). The MBE is a climatic transition from low magnitude interglacial/glacial cycles during the early Middle Pleistocene to extreme warming and cooling in interglacial/glacial cycles that occurred after 500,000 years B.P. Whether this is a global phenomena or is true for only specific regions of the world is unclear due to the nature and distribution of many of these records (see previous abstract and poster). If this climatic history is applicable to northern Europe then it has major implications for the environments, climate and landscape of the earliest human occupation.

This poster reviews the palaeoclimate evidence from the early Middle Pleistocene of Britain and neighbouring regions. In this review, deposits from the early Middle Pleistocene of Britain are divided into four main groups based on the biological and sedimentological evidence they contain for the prevailing climate that existed during their deposition. Group 1 comprises deposits with evidence for temperate climates with temperatures in excess of modern day conditions. Deposits of Group 1 comprise sites such as Pakefield, Sugworth and Little Oakley, palaeoclimatic reconstructions from which indicate climates as warm as any that occurred in interglacials of the last 500,000 years. These deposits reflect sediment accumulation during the "climatic optimum" of an interglacial. Deposits of Group 2 comprise sites such as West Runton which contain evidence for temperate climate conditions with no proxy evidence for temperatures that were any warmer than those of the present day. Group 2 deposits could reflect sediments accumulating during interglacials that were no warmer than the present day or before/after the climatic optimum of very warm interglacial episodes. Group 3 comprises deposits that are generally temperate in character but produce temperature reconstructions which are cooler than the present day such as High lodge and Waverley Wood. These could reflect interstadial events or deposits laid down at the beginning/end of an interglacial. Group 4 comprises sediments that indicate the existence of widespread periglacial conditions, either through the accumulation of coarse-grained braided river deposits or the formation of periglacial soil features such as ice wedge casts, frost cracks or sand wedges. Absolute temperature reconstructions from Group 4 sediments are problematic due to the absence of biological proxies such as coleoptera. A final Group of deposits could be those related to lowland glaciation, i.e. tills and outwash, however, their presence in Britain during the early Middle Pleistocene is not universally accepted.

Comparisons between the British sedimentary record of the early Middle Pleistocene and the sedimentary record of the late Middle and Late Pleistocene indicates that the degree of interglacial climate warming prior to 500,000 years was as extreme as that which occurred in any interglacial over the past 500,000 years. Equally, the abundance of periglacial features, both fluvial and peodgenic, in the sedimentary record of the early Middle Pleistocene suggests that cold climate episodes during this episode were also as severe as many of the glacial stages that occurred in the late Middle and Late Pleistocene. There is, therefore, no evidence for the Mid-Brunhes event in the British sedimentary record.

With regard to human occupation during this period these conclusions have two main points of significance. Firstly, the earliest Humans in northern Europe must have been able to adapt to a variety of climatic and environmental conditions and exist in a range of landscapes. Flint artefacts are found in association with sediments from deposits of Group 1, 2, 3 and 4, although those in periglacial deposits typically show signs of reworking. Secondly, the environments of human occupation in the early Middle Pleistocene were subjected to climate fluctuations as extreme as those that occurred in the late Middle and Late Pleistocene. Consequently, it is likely that the pattern of regular episodes of colonisation and abandonment, observable in the British record of the past 500,000 years, would of occurred pre-500,000 years.

The Cromerian landscape: Environments of Europe's earliest inhabitants.

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Recent discoveries in East Anglia have pushed back the date for the earliest peoples in Britain to *ca.* 700,000 years BP (late MIS 17; Parfitt *et al.,* 2005). The evidence suggests that these early peoples moved along ancient floodplains, crossing into peninsula Britain from Europe across a land bridge that existed between southeast England and northern France. The archaeological evidence published to date has been recovered from a variety of depositional environments, and many of these deposits have also preserved a diverse range of palaeoenvironmental proxies (e.g. pollen, vertebrates, sediments and landforms) detailing the landscapes and climates that these early humans inhabited. These landscapes vary from mosaics of forests and grasslands under a

Mediterranean climatic regime (e.g. Pakefield; Parfitt *et al.,* 2005, Coope, 2006, Candy *et al.,* 2006), through warm temperate, mixed woodlands and open areas (e.g. Boxgrove; Roberts and Parfitt, 1999, Preece and Parfitt, 2000) and cool, temperate conditions similar to modern day Scandinavia with boreal forests and grasslands (e.g. High Lodge; Ashton *et al.,* 1998, Coope, 2006). These deposits are generally preserved due to burial by glacial or periglacial processes and thus protected from erosion.

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Micromorphology of cut-marks on large mammals remains from Boxgrove, West Sussex, England.

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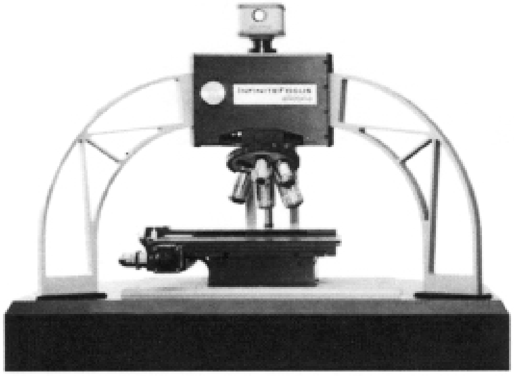
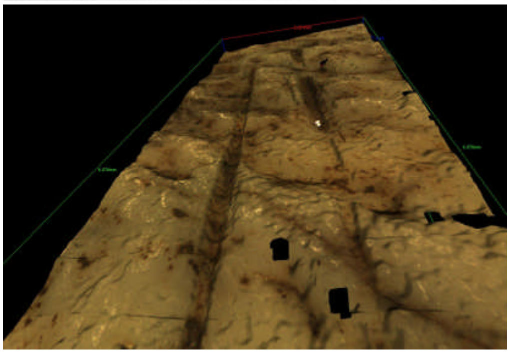
Cut-marks on fossil bones and teeth from Palaeolithic sites provide direct evidence for the procurement of meat through technological means. As such, they yield information on the cognitive ability and behaviour of early humans.

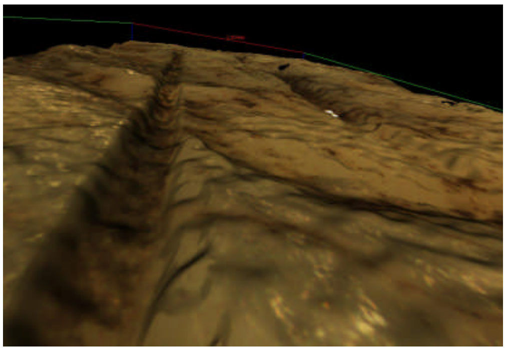
In this poster we present preliminary results of the analyses of cut-marks found on dental and skeletal remains of early Middle Pleistocene large mammals (including humans) from the Acheulean site at Boxgrove (UK). We utilized a new technology, which captures three-dimensional images of cut-marks and records profile parameters. This microscopic method provides results that are more informative than any current SEM and optical technique.



Alicona 3D InfiniteFocus® microscope

Alicona images of cutmarks on Boxgrove bone.





Observed differences in cut-mark micro-characteristics demonstrate the method's potential for interpreting butchery processes (e.g. skinning, filleting, disarticulation, slicing, chopping) and the type(s) of butchery tool utilised (e.g. handaxe, flake, retouched flake).

Neanderthals in Acton

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This poster presents the results of research into technological behaviour during the early British Middle Palaeolithic (Late OIS 9-7), as reflected by lithic artefacts. The British data-set, whilst containing few high-resolution sites providing information relevant to ethnographic-scale behavioural reconstruction, actually forms a valuable corpus of well-contextualised locales within a tightly constrained chronostratigraphic framework. Lithic artefacts from these sites can be used to address broader questions concerning the emergence and nature of particular "Middle Palaeolithic" behaviours; specifically, the emergence of, and variability within, Levallois technology in Britain, and increasing complexity in the organisation of technology in the landscape.

The assemblages analysed comprise the nine best-preserved British sites dated to this period, which can be placed within secure chronological, geographical and ecological contexts. Whilst previous surveys have emphasised the typological composition of such assemblages, here the emphasis is placed upon the specific technological behaviours evident at particular locales, in terms of which stages of lithic reduction are represented, what specific Levallois preparatory and exploitation strategies were applied, and how the choices between such options are explicable. On this basis, it is possible to discuss the development of a technologically complex treatment of particular places in the landscape during the early Middle Palaeolithic, linked to the increased transport and curation of particular Levallois products. Whilst on a European scale, such patterns are seen as typical of the Middle Palaeolithic but are essentially undated; this study shows that such behaviours are apparent from at least OIS 8 onwards in Britain, with concomitant implications for our understanding of developing Middle Palaeolithic behaviours in Europe.

Initial excavations at Sproughton; environments of human occupation during the Lateglacial/Early Holocene

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The late Quaternary sequence at Sproughton is a key site for understanding the Upper Palaeolithic of Britain. The site lies on a floodplain of the River Gipping, West of Ipswich, and was discovered through gravel extraction during the 1960s and 1970s and subsequently excavated (Wymer *et al*., 1975; Rose *et al*., 1980). The deposits preserved below the modern floodplain comprise a complex succession of fluvial, slope and pedogenic sediments, deposited episodically from the beginning of the Lateglacial through to the present day. These deposits provide evidence for at least three, apparently separate, periods of human activity (Wymer *et al*, 1975; Barton, 1991). Two distinct barbed points, recently re-dated to 10,960 ± 50 and 11,485 ± 60 for AHOB2 (R. Jacobi, pers.comm.) were found within fluvial sands and gravels dating to the Younger Dryas climatic event. A prolific flint-working site was also discovered on the surface of a fluvial gravel bar and this is believed to be younger than both the barbed points, either late Younger Dryas or early Holocene in age (Wymer *et al.*, 1975; Barton, 1991).

The Lateglacial period is characterised by dramatic and rapid shifts in climate and environment. The sequence at Sproughton provides a unique opportunity to understand episodes of human activity in the context of changes in landscape and environment. The Sproughton sequence provides a wide range of environmental proxies (pollen, molluscs, insects) and material suitable for high precision dating (OSL, 14C, U/Th) which will allow the relationship between landscape dynamics and human occupation during a period of environmental instability to be more clearly understood.

Current research at Sproughton has rediscovered the flint working site on the surface of a gravel palaeo-bar, observable in sections cut by the modern river. Three detailed sedimentary sections have been examined for study through sedimentological, palaeoecological and geochronological techniques. This has been done in order to understand the timings of the changing style of environmental and geomorphic processes that has occurred over the period of human occupation.

The succession appears to be a fluvial sequence, dominated, initially by high energy sand and gravel deposition by a braided river system and, subsequently, by low energy overbank sedimentation and incipient peodgenesis. The artefacts that have been recovered from this sequence are flint blades of a typology characteristic to that of Late Palaeolithic forms. These blades occur within a sandy unit, found above the gravels. Within this assemblage, however, two artefacts typical of Neolithic practices were found. This archaeologically rich unit has been altered by pedogenesis and detailed micro-morphological work is being undertaken to establish whether: 1) a complex soil profile exists, the formation of which has led to the mixing of two assemblages, and 2) two discrete soil horizons, and, therefore, two discrete occupation surfaces, of different ages can be observed.

Further work will focus on constructing a high precision 14C and OSL based chronologically for this sequence, in order to reliably constrain the timing of different phases of human occupation. Work over the next two years will focus on studying the lower parts of the Sproughton Lateglacial sequence in order to provide a high precision record of environmental change which will provide a climatic framework, into which, the earlier phases of occupation may be placed.

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The AHOB Database

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The AHOB database contains a growing collection of data that document conclusions reached in the AHOB project. Now the database is accessible only to project members, but it will be made publicly available via the Internet at the end of the project. Project members are encouraged to contribute any data that they wish to be made public in this manner. Most types of data can probably be accommodated, but data that can be associated with an excavation site will best fit the current paradigm. The database is also intended to serve as an archive of electronic associated data, such as field photos, excavation notes, and other supplementary files, but to date no such archival material has been submitted. The password-protected working version of the database can be accessed through the members-only part of the AHOB website:

While the data are primarily intended for scientific researchers, some minor effort is being made to make the Internet database of general interest. Short non-technical summaries of each site will be provided that give a sense of its history and importance. Photos are also included where they are available.

In its current state, the AHOB database contains records for 254 British Pleistocene sites, some of which are key project sites and others of which are of peripheral interest. Mammal faunal lists, a coarse assessment of the archaeology present, and the age are available for most sites, in addition to general geographic information. Radiocarbon or other dates, stable isotope readings, photos, associated publications, and maps are available for some.

Project members are encouraged to regularly provide the following kinds of data to David Polly by e-mail for inclusion in the database:

1. complete references and PDFs (if available) of papers published under the umbrella of the AHOB project;
2. dates and isotope readings;
3. faunal lists;

4. archaeological information;
5. photos and other archival materials.

On the technical side, the AHOB database has been compiled in a relational structure in Microsoft Access©. To make data accessible on the Internet, that data is exported to mySQL©, a free relational database system that is available for many computer platforms and which can easily be interfaced for web browsers. David Polly has written a web interface for the database that allows users to browse or search the data (Figure 1).

In addition to having its own interface, discussions are underway to link the AHOB database (when it is publicly released!) into a Paleoanthropology Portal, which will allow users to search across several independent databases that are relevant to paleoanthropology. Users will be able to use the Portal to discover data of interest and will be referred directly to the providing database for more detailed exploration. Information about that project can be found at: http://paleoanthportal.org/

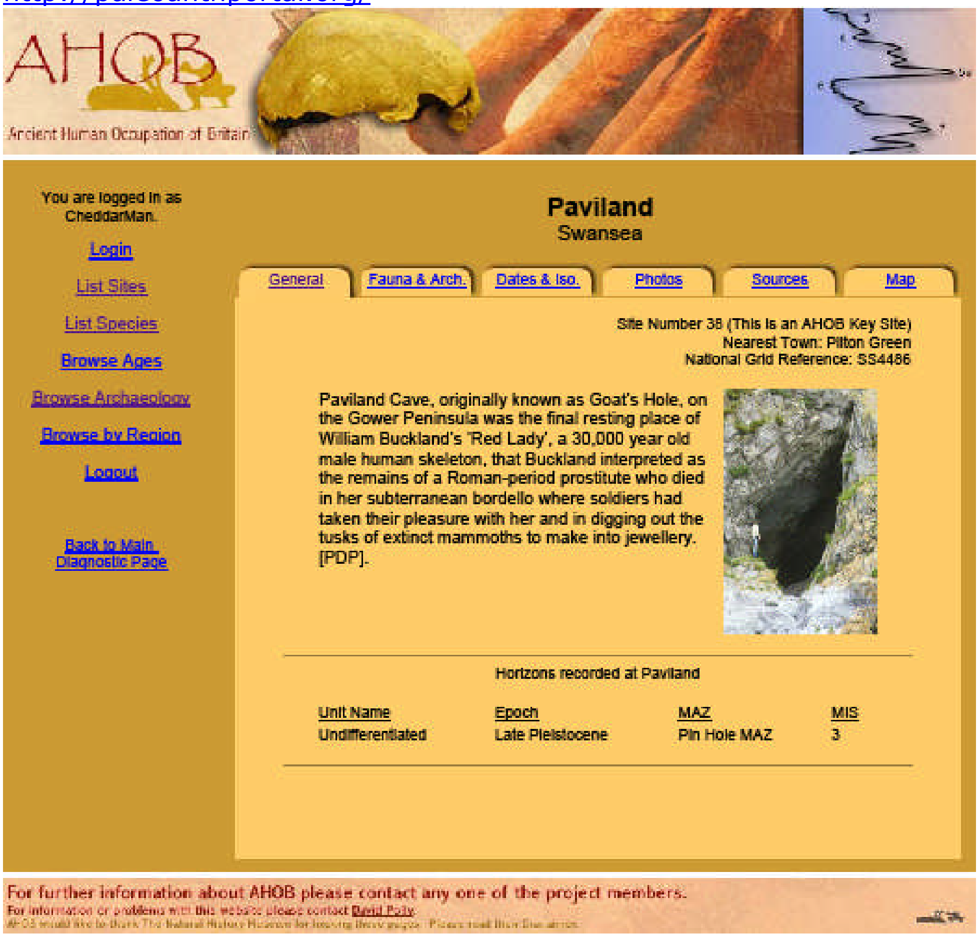
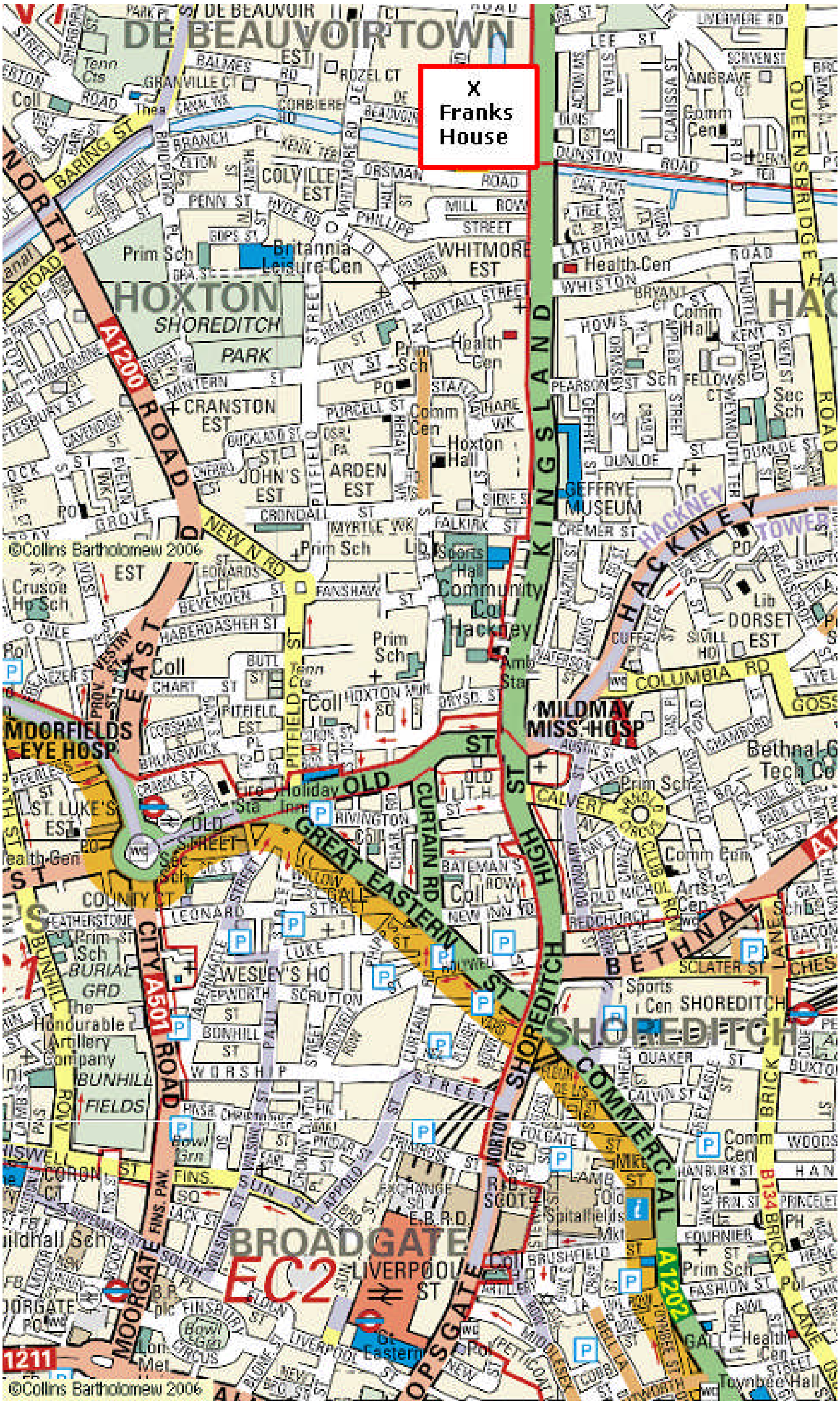


Figure 1. A screen shot from the AHOB database.

Users can locate data by clicking on the links at the left (List Sites, List Species, Browse Ages, Browse Archaeology, or Browse Region). Once a desirable site is identified, users can list general information, fauna and archaeology, dates and isotope readings, photos, bibliographic sources, and an online map by clicking the tabs. Sites are interlinked by clicking. For example, if one browses the fauna of the Aveley site in Greater London, one can click on the name *Bos primigenius*, which retrieves information (and photos, if they are available) about the Aurochs. Another click retrieves a list of all sites with that species in the faunal list. The same principle is functional with archaeology lists, bibliographic sources, and ages.

Franks House, 56 Orsman Road, London N1 5QJ



The 149 and 242 buses run from Liverpool St Station from Bishopsgate, which is on the east side of the station. Take the bus northwards which heads up Bishopsgate, Shoreditch High Street and then Kingsland Road. After about 1.5 miles (2 km) get off the bus opposite the mosque (one stop after Shoreditch Hospital). Orsman Road is 50m further up on the left. Franks House is at 56, marked X on the map.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